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FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

In the Matter of)
)
Carriage of the Transmissions)
Of Digital Television Broadcast Stations)
)
Amendments to Part 76)
Of the Commission's Rules)

CS Docket No. 98-120

Reply Comments Of New World Paradigm, Ltd.

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CS Docket 98-120(FCC 98-153)
Reply Comments Of New World Paradigm. Ltd.

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SUMMARY

Our reply comments show that the constitutional arguments against digital-must-carry have at their base a technical assumption that the only way to deliver cable channels to consumers is through the "headend" approach. The technical constraints create a situation where any mandatory digital carriage necessarily entails an abridgement of rights. However, NWP shows there is an alternative way to deliver such channels -- the "channel-addressing" approach. The headend approach provides the concrete, physical foundation for claims that mandatory carriage abridges certain parties constitutional rights. The channel-address method of channel delivery inherently creates physical conditions that are harmonious with First and Fifth Amendment Rights. If channel-addressing were the method of channel delivery, it would be highly unlikely that any parties could successfully show they were being denied precious freedoms. The market is advancing so rapidly that the tools to implement channel-addressing are at hand. A headend channel delivery system where accommodation to technical change and market growth necessarily entails the violation of constitutional rights should be supplemented if not supplanted by a channel delivery system where such accommodation is unlikely to entail an abridgement of rights. The Commission's policy should be aimed at developing a

situation where technical change created by DTV and where DTV's market growth are not antithetical to constitutional freedoms.

NWP believes channel-addressing is preferable to expanding capacity from 300 MHz to 750 MHz, for example, and then using headend delivery to convey more and more channels to the consumer. As long as headend channel delivery prevails, the increased capacity will be used to "store" more channels in the cable itself rather than delivering them to consumers. Higher storage ratios requires that the original video signal be subject to compression ratios that will degrade the quality of video service and retard DTV's market growth.

Over-the-air DTV reception problems would be greatly reduced if channel-addressing were used because its system architecture benefits low power stations and audiences not accessible by wire. There is an open part of the spectrum between 80 GHz and 100 GHz and that is not assigned to anyone today. It could be used for TV broadcasts relying on a very short wave length of less than one-half centimeter. This wavelength provides much greater directionality in the receiving antenna than the traditional wave lengths now used for over-the-air broadcasts. Broadcasters also have the opportunity to expand and improve coverage by having Class A service over regions far larger than Class C areas. Furthermore, at the less than half centimeter wavelength many, many wide-bandwidth broadcast channels are available – far more than what is available in the entire UHF and VHF spectrum.

**REPLY COMMENTS ON CS DOCKET 98-120 (FCC 98-153):
NEW WORLD PARADIGM, LTD .**

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REPLY COMMENTS ON NPRM - CS DOCKET 98-120(FCC 98-153):

NEW WORLD PARADIGM, LTD.

INTRODUCTION

New World Paradigm, Ltd. is a research firm specializing in the development of communications and video technologies. NWP has a patent-pending software system which achieves digital compatibility between broadcasters, TV set-makers and cable operators more effectively than hardware without disrupting the industries. NWP wants the DTV market to grow. NWP's reply comments draw on and respond to certain comments made by the Association of Local Television Stations, Cable Telecommunications Association, Harris Corporation, Microsoft Corporation, National Association of Broadcasters, Tele-Communications, Inc., and Time Warner Cable.

A. *The Headend Method Of Channel Delivery Inherently Creates Physical Conditions Which Give Substance To Arguments That First And Fifth Amendment Rights Will Be Abridged.*

Constitutional arguments against "digital must-carry" are largely but not exclusively based on the assumption that cable capacity is in short supply. Commenters opposed to mandatory carriage assert it will displace channels such as C-Span, and therefore, abridge the First and Fifth Amendment rights of cable programmers and

operators. If there is a shortage of cable capacity in any cable system, the shortage results directly from the headend method of delivering cable channels to consumers.

It is a terribly inefficient way to deliver channels. NWP's initial comments explained the headend principle's severe operational disadvantage -- it places all channels in the cable at every moment, even when the channels are not watched. Also, every channel's width is limited to 6 MHz. The peculiar and inefficient result is that most cable capacity is used up by the channels that are not watched. The cable is used almost exclusively as a warehouse, storing dozens of unwatched channels in 6 MHz bins while the chosen one is taken from inventory and displayed on the consumer's TV. Harris' comments at page 6 confirm that the headend channel delivery is primarily a way to store channels:

700 consumers [were] ...selected as representative of the U.S. population... 78 percent said they watch 10 or fewer channels per week ...

Many cable systems carry upwards of 50 channels, each 6 MHz wide, moment-by-moment. If only 10 are watched in week, it's clear that most channels are "warehoused" and that only a tiny portion of the cable's capacity is actually used as pathway to deliver video services. Thus headend channel-delivery is a terribly inefficient use of bandwidth, but the inefficiency is the concrete, physical foundation for claims that mandatory carriage abridges certain parties constitutional rights. Every constitutional argument has at its base the hidden assumption that the headend is an inescapable technical limitation of the cable system.

B. *The Channel-Address Method Of Channel Delivery Inherently Creates Physical Conditions That Are Harmonious With The First And Fifth Amendment Rights.*

The channel-address principle utilizes capacity efficiently because it adheres to the Internet communications method, where consumers at their discretion initiate and terminate contacts with a television address. With channel-address delivery, cable capacity is devoted almost exclusively to those video channels being watched and none are stored in the cable. Furthermore, channel width is not limited to 6 MHz. The width can be very large because the cable itself has capacity of several hundred MHz, which is then being devoted only to channels being watched. The unwatched channels are stored by the thousands in a video server. They are summoned to a TV or other display device by the consumer. Mandatory carriage under channel-addressing is not likely to displace channels such as C-Span, and therefore, is not likely to abridge the First and Fifth Amendment rights of cable operators and others. Thus channel-addressing enhances the diversity of the cable-programming market, promotes a far more efficient use of existing capacity, thus promoting the Digital TV set market and preserving broadcast television's benefit of free widely accessible programming.

C. *Channel Delivery Methods Are Physical Acts That Can Be Evaluated For Constitutional Import.*

The physical mechanics of channel delivery show that “mandatory carriage” is a misnomer. It is more accurate to say that a channel is “mandatorily stored” so it can be summoned from inventory by the consumer. The actual location of the storage, its physical characteristics and the physical manner of channel delivery will be pivotal in any judicial review of “digital must-carry” because the courts will assess such physical aspects for their constitutional import. This point is well-made by the Cable Telecommunications Association in its comments at page 19, footnote 31, as well by Time Warner at page 28 of its comments. Both quote from the dissenting opinion of Justice J. Williams in Turner Broadcasting System Inc. v. F.C.C. :

The insertion of a local stations’ programs into a cable operator’s line-up [is not] a metaphysical act [but] takes place on real property.

Since channel -delivery is indeed a physical act, it can be observed and evaluated regarding:

- Where the channel storage occurs;
- Communications mode – 1 way or 2-way;
- Who brings the channel to the consumer’s premises;
- Where the delivery ends;
- How long the channel resides in the cable;

- How the delivery affects cable capacity for other uses;
- The primary use of cable capacity;
- Channel width.

The following descriptions clarify important differences between the two methods of channel delivery.

<u>Evaluation Measures</u>	<u>Headend Delivery</u>	<u>Addressing Delivery</u>
Channels are stored in the:	Cable	Video Server
Communications Mode Is:	1-Way	2-Way
Channel brought to premises by:	Service Provider	Consumer
Delivery ends at the:	Consumer's TV set	Consumer's TV set
Channel resides in the cable:	Permanently	Intermittently
Cable capacity for other uses is:	Diminished	Increases
Capacity primarily used for:	Storing channels	Delivering channels
Channel width is:	6 MHz	Far more than 6 MHz

Taken as a whole, the characteristics listed under "Addressing Delivery" are harmonious with the First and Fifth Amendments, as discussed below.

D. Channel Delivery Through Addressing Reduces the Potential For The Abridgement Of First And Fifth Amendment Rights

The channel-addressing method of delivering channels to consumers profoundly diminishes digital must-carry's potential to abridge cable operators' First and Fifth Amendment rights.

In the First Amendment instance:

1. When a video server houses literally thousands of addressable channels, some owned by cable companies and some owned by broadcasters, and;
2. When those servers also serve as routers that interconnect with each other, and;
3. When consumers initiate channel delivery to their premises at their discretion;

Then

- It is highly unlikely that any cable operator could successfully claim its cable system is "channel locked."
- It is highly unlikely that any party could make a successful showing that its free speech is being suppressed by must-carry rules, unless its channels were denied residence at the video servers;
- It is highly unlikely that any party could make a successful showing that must-carry rules are content-based and diminish programming diversity.

In the Fifth Amendment instance:

1. When capacity is returned to the cable network by the simple act of the consumer terminating the connection to the addressable channel ; and
2. When a channel uses cable capacity only at the consumer's discretion,

Then

- It is highly unlikely that even momentary occupation of the channel could be construed as government ordered, and;
- It is highly unlikely that any party could make a successful showing that the video signals, be they electronic or otherwise, constitute a permanent physical occupation of real property and a *per se* taking of private property;
- It is highly unlikely any party could make a successful showing that an identifiable class of cable systems is created and eligible for just compensation for the taking of private property and consequently that such creation encroaches upon "Congress's exclusive power to raise revenue."¹

E. *The Tools To Implement Channel- Addressing Are At Hand*

There is a clear case for channel-addressing to be the standard procedure to deliver channels to consumers. Cable operators are well on their way towards the use of 2-way communications and the development of niche-video markets which could be so

¹ See Cable Telecommunications Associations Comments, page 25.

easily created through a network of interconnected video servers. For example, in its comments Tele-Communications, Inc. at pages 15-16 asks:

How will advertising and customer billing change in a world where digital technology allows the creation of highly targeted niche programming services, and where two-way networks facilitate consumer interaction with programming and advertising content?

Cable operators are clearly contemplating the ability of consumers' and their equipment to reach out and initiate contact with video services. For example, in its comments Tele-Communications, Inc. at page 14 says:

The digital customer terminal is not simply a device that descrambles signals and passes them through to [TVs] and VCRs, but rather is a highly sophisticated network computer that contains enormous amounts of processing power and memory.

Cable operators clearly recognize that digital video services will call forth video servers and new system architecture, perhaps similar to what NWP described in its initial comments at pages 21-23. For example, in its comments Tele-Communications, Inc. at page 15 says:

A web of computer servers, routers, switches, nodes, fiber-optic and coaxial cable and gateways to other services, such as the Internet, must be integrated by the cable operator to launch digital services for consumers.

The addressing method of channel delivery will greatly enlarge the video services market, offering more consumer choice, diversity and more channel –access than could ever be had through headend delivery. Channel-addressing allows the entire television industry to escape the dilemma revealed in Harris' comments page 6:

700 consumers [were] ...selected as representative of the U.S. population... 56 percent said they would give up channels in order to get high definition programming.

With channel-addressing no one has to give up channels. The technology allows a video server and a network of interconnected video servers to “house”, “store” and “warehouse” channels in great number, so they are easily summoned by consumers. Cable operators who develop networks of interconnected video servers have tremendous opportunity to develop new markets. Broadcast stations and other video services that are fortunate enough to house their signals in video servers also have tremendous opportunity for growth. This promising at-hand future will make moot claims that cable systems are “channel locked” and, therefore, that “digital must carry” abridges First and Fifth Amendment rights. Unfortunately, this development may be unwelcome where it injures the status-quo in market shares and necessitates the development of new business strategies.

F. Establishing The Interest Being Served By Must-Carry Rules

A fusillade of constitutional arguments have been aimed at the Commission seeking to persuade it that any action for must-carry necessarily entails a violation of constitutional rights. Even the NPRM itself is construed as the Commission’s means to deprive. Time Warner comments at page 13:

Until the Commission identifies the interests served, commenters cannot meaningfully analyze even whether must-carry rules would be content-based or

otherwise subject to strict scrutiny under the First Amendment. Thus, the Commission has deprived cable operators of a meaningful opportunity to comment.

However, Time Warner's basis for its claim stems from the observation that "coherent" policy is just not possible:

That the Commission should propose must-carry requirements without identifying the interests such requirements might serve is perhaps not surprising: at this early stage, it is simply impossible to formulate a coherent basis in policy

NWP disagrees because we believe the "coherent basis" for policy is readily apparent.

- A headend channel delivery system where accommodation to technical change and market growth necessarily entails the violation of constitutional rights should be supplemented if not supplanted by a channel delivery system where such accommodation is unlikely to entail an abridgement of rights.
- Commission policy should be aimed at allowing the market to develop channel delivery systems that are unlikely to abridge constitutional rights so that technical change and market growth are not longer antithetical to precious freedoms.
- The "channel address" method of channel delivery is unlikely to entail an abridgement of rights.

Therefore

- The Commission serves the public interest and private interests by pursuing must-carry rules that allow channel-addressing technology to be adopted in the market place.

NWP believes a significant step towards such adoption is made by expanding the statutory definition of a cable channel as proposed in NWP's initial comments:

A channel is also any Internet-addressable video service engineered for the electromagnetic spectrum carried solely in wired networks from the producer of the video service and delivered through a video-server and made available for and to subscribers of a cable system.

NWP believes this principle is a more effective way adding capacity to unlock "channel locked" systems.

G. *Capacity Additions Combined With 'Headend' Delivery Are Likely To Be An Ineffective Way To Grow The DTV Market.*

NWP's initial comments at pages 20-23 emphasized channel-addressing's beneficial effects for cable operators' capacity :

Television programs no longer have to fit within a 6 MHz channel width because channel width is not a meaningful parameter in an addressable wired network... capacity is no longer being used up by video services that are not being watched or recorded -- in an addressable environment coaxial home-run cables will no longer have to deliver 60, 80 or 100 channels

simultaneously, instead 8 to 10 video channels could be shipped through the cable.

This is one solution to the cable operators concerns over 'channel locked' systems. NWP believes channel-addressing is preferable to expanding capacity from 300 MHz to 750 MHz, for example, and then using headend delivery to convey more and more channels to the consumer. As a case in point for digital-must-carry, the National Association of Broadcasters' Statement of Jenner & Block, page 20 says: "Cox has indicated that with the roll out of digital services 'Cox's weighted average number of channels per system will increase from 56 to more than 200.'"

Apparently the NAB believes this capacity could be used for digital must-carry. NWP disagrees and believes this approach would be self-defeating for the DTV market. As long as headend channel delivery prevails, cable operators will be using even higher portions of their capacity to "store" even more channels that are 6 MHz wide. Higher storage ratios requires that the original video signal be subject to:

- ❑ Higher compression ratios, ranging from 60 to 1 down to 20 to 1, and
- ❑ Greater reliance on statistical multiplexing and interleaving.

These steps introduce more potential for signal degradation and motion aberrations, *reducing DTV's attractiveness to consumers and calling into the question the wisdom of switching from an analog environment.*

Therefore, NWP disagrees with the NAB's analysis and the comments in its Appendix D, "Cable System Capacity: Implications for Digital Television Must-Carry," pages 23-25, prepared by Strategic Policy Research (SRP). These comments invite readers to infer that digital encoding somehow allows compression to solve the 'channel lock' problem. The Commission would be making a substantial technical error if it made such an inference.

Digital encoding is a technical issue separate from and unrelated to compression. Digital encoding literally perfects the signals in a channel. However, digital coding does not reduce the number of bits that have to be transmitted in a digital signal, whether it is HDTV or SDTV. The reduction is accomplished by compression.

The "invitation-to-infer" a causal link between digital coding and compression begins at page 23, the end of the first paragraph, where SRP says:

An even more significant development, however, is the introduction of digital encoding and compression into the world of video transmission and distribution.

The second full paragraph at page 23 details the benefits of digital encoding:

when a digital signal is sent down a transmission line such as a coaxial cable, it too may need to be amplified periodically... 'amplifiers' ... regenerate the ones and zeros they receive ... the signal leaving the amplifier is the same as the signal that entered the system. There is no accumulation of noise, which allows higher quality reception... Even in the event that there are errors in some bits, error-correcting codes are used to eliminate them.

This statement is accurate if the environment is purely digital, or synonymously, purely binary. Unfortunately, video distribution is not a pure digital environment, as indicated at page 23, the third paragraph:

For video distribution, these digital pulses are modulated into a radio frequency analog signal, and sent on the same 6MHz channels used for analog signals.

The instant the signals are “modulated into a radio frequency analog signal” the benefits of encoding are substantially reduced and picture quality rapidly retreats from what it could be in the pure digital environment. However, compression is a more serious problem. The SRP analysis explicitly ties digital encoding to compression at the bottom of page 23 and through the first paragraph of page 24:

binary digits allow[s] the signal to be compressed to remove any information which may be redundant or irrelevant... sharply reducing the number of bits required to convey the signal to the end user... MPEG-1 and MPEG-2 have been adopted for digital compression, with the result that many television signals can be carried in a single 6 MHz channel.

Yes, they can be carried but not well. Just how much “sharp” reduction is needed for an HDTV signal if it is compressed into a 6 MHz channel carrying 38 Megabits per second? The amount of compression for any ATSC signal can be easily calculated.

For example, a minimum of 16 bits per pixel are needed for digital color display . The top ATSC HDTV signal is a 1080 line interlace standard using 1920 pixels per line at 60 frames per second. This creates a transmission rate of nearly 2 Gigabits per second

before compression. If a 6MHz channel handles at most 38 Mbits per second², then the required compression ratio is 52, meaning that the delivered bits are only 2 per cent of original bit count. A 720 progressive scan at 60 frames per second creates a transmission rate of nearly 900 Megabits per second before compression. The required compression ratio is 23, meaning that the delivered bits are only 4.3 per cent of original bit count. It is very, very unlikely that the delivered picture is a true rendition of the original if it contains motion. The only “lossless” compression scheme NWP knows of has compression ratios ranging from 1.92 to 2.98.³

High compression ratios cause anomalies and motion aberrations which degrade picture quality. For example, it is counter intuitive that 1080 line picture would be inferior to a 720 line picture, but this is exactly what happens with high compression, as Microsoft noted in its comment at page 24:

As abundant record evidence in MM Dkt. No. 87-268 demonstrates...a 720-line progressive-scan HDTV has in fact been demonstrated to be superior in quality to a 1080-line interlaced picture.

Therefore, NWP disagrees that the “conservative example” provided in SRP’s analysis at page 25 is conservative:

² See NAB’s Appendix D, “Cable System Capacity: Implications for Digital Television Must-Carry,” by Strategic Policy Research, page 25.

³ See EETimes “Lossless image compression algorithm harnesses entropy” at <http://www.eet.com/story/OEG19981113S0040>

...if an 80-channel system devoted 4 channels to digital, ran the digital channels at 38 MB/s and ran 18 multiplexed video signals per channel, then the total system capacity would be 76 plus 4 times 18 or 148 program services.

There may 148 services but their quality would be significantly degraded. Since 148 channels are bound to have programs of varying aspect ratios and pixel densities, the various layers of multiplexing and compression will degrade video signals and will be an ineffective way of growing DTV markets. There is no reason for consumers to purchase expensive DTV sets if the digital pictures are poor or barely different from the analog ones. NWP believes that the channel-stacking advocated by the NAB will lead to unattractive DTV video service that will be shunned by consumers. More importantly:

- **With channel addressing high compression ratios are not needed; a ratio of 3 will do nicely to preserve the original picture and truly give the consumer an eye-full of crystal clear detail and “sharp” images.**

H. Preserving Free Over-The-Air Television For Consumers Who Are Not Cable TV Subscribers

Channel-addressing will hasten the day when the UHF and VHF bands are returned to the government. In the UHF and VHF wavelengths TV signals occupy such a large bandwidth portion of that spectrum that it may be better for them to be used for something other than TV broadcasts. Those broadcasts go only to the visible horizon and consequently cover a limited area. It may be a better policy to migrate broadcasts to a

much shorter wavelength where the same area is covered in a cell-like fashion by small transmitters that handle many more channels which can be far wider than the 6 MHz and which do not need the punishing compression levels of 20 and 50 to 1. This could be a welcome compromise to the parties opposing digital-must carry.

Many commenters who oppose digital-must carry offer directional antennas as an alternative. This approach is resisted by broadcasters. The Association of Local Television Stations (ALTS) comments at page 80 and footnote 190:

Multi-path interference may cause significant reception problems, especially indoors. This problem will compound the power disparities that exist in the DTV table. Over-the-air reception problems will be greater in the DTV world than they were in the analog world...an antenna that is just of 15 degrees may not produce a signal.

Over-the-air DTV reception problems would be greatly reduced if channel-addressing were used because its system architecture benefits low power stations and audiences not accessible by wire. NWP at page 20 of its initial comments said:

by adopting very-short-wave length transmission techniques and using small distributed transmitters fed by wired network...audiences not accessible by wire [could be reached]...Local and low power stations retain the ability to compete while also reaching a broader audience.

There are open parts of the spectrum that ranges from 80 GHz to 100 GHz and that are not assigned to anyone today. It could be used for TV broadcasts relying on a very short wave length of less than one-half centimeter. This wavelength provides much greater directionality in the receiving antenna than the traditional wave lengths now used

for over-the-air broadcasts. In other words, it's much easier to receive a DTV over-the-air broadcast signal when the broadcast wavelength is very short and the distance from the source to the antenna is less than 2 miles rather than 50 miles. This is one way to solve the over-the-air reception problem described by ALTS. Furthermore, the small distributed transmitter receives its signals from the wired network, thus serving as a multi-channel broadcasting source, where many signals are sent over the air simultaneously. This technical situation avoids any need for multiple transmitters in a given area while giving consumers abundant choices of over-the-air broadcasts. This is how channel-addressing's architecture preserves over-the-air TV for consumers who do not subscribe to wired networks. Equally important for local telecommunications infrastructure:

- The same sites used for locating PCS towers could also house the small distributed transmitters thus eliminating the need to find new sites.

This would be a windfall for the PCS industry and broadcasters, if they successfully negotiate with each other for such common site location. Broadcasters also have the opportunity to expand and improve coverage by having Class A service over regions far larger than Class C areas. Furthermore, at less than a half centimeter wavelength many, many wide-bandwidth broadcast channels are available – far more than what is available in the entire UHF and VHF spectrum. Therefore, broadcasters' cost for supporting the less than one-half centimeter architecture can be distributed among many channels and many channel owners, unlike today's arrangements where each channel

owner supports their individual transmission plant. It would be as if antenna-multiplexing were available to the entire industry without the need for separate transmitters for each channel.

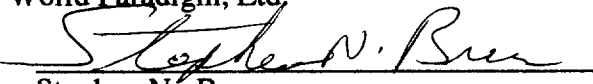
Channel-addressing's architecture serves non-wired customers who are "relatively adjacent" to wired networks rather than being far removed and isolated from thoroughfares, much in the same way that a cellular phone works in proximity to highways and roads but fails in truly isolated areas. Of course, UHF and VHF transmissions are not available in isolated areas.

I. *Is The Commission Is Barred From Adopting Policies That Would Give Incentive To The Market To Improve The Efficiency With Which Cable Systems Use Capacity?*

Time Warner comments at page 29: "The Eighth Circuit Court held that a requirement that cable operators expand their channel capacity to accommodate public-access channels effected a taking [of property]." To the extent that more efficient use of capacity is tantamount to expanding it, is Time Warner suggesting the Commission is barred from adopting policies that would give incentive to the market to improve the efficiency with which cable systems use capacity? Is the Commission is barred from such activity? NWP believes the benefits of the Commission adopting policies aimed at promoting channel-addressing in the market, as well as developing a situation where technical change created by DTV and DTV's market growth are not antithetical to constitutional freedoms, would greatly benefit industry and consumers and hasten the development of a truly broadband infrastructure. It would be unfortunate if the Commission were restrained from pursuing such a course.

Respectfully Submitted,

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